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EXAMINER	
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ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/672,056	CHHIBBER ET AL.	
	Examiner	Art Unit	
	Michael P. Stafira	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-346 is/are pending in the application.

4a) Of the above claim(s) 201-227 and 327-346 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12,18-22,26-93,97-110,116-120,124-191,195-200,228-246 and 248-326 is/are rejected.

7)☒ Claim(s) 13-17,23-25,94-96,111-115,121-123,192-194 and 247 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 25 September 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 12/21/05;8/23/04;.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 201-211, 212-227, 327-346 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected groups II-IV, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 12/21/2005.

2. Applicant's election with traverse of groups II-IV in the reply filed on 12/21/2005 is acknowledged. The traversal is on the ground(s) that there is not a serious burden on the examiner to combine the groups I-IV. This is not found persuasive because each group can be searchable independently in the different subclasses for groups I-IV and therefore is a burden to the examiner.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 9-10, 18-19, 26, 80, 83, 92, 103-104, 107, 116-117, 124, 178, 181, 190 are rejected under 35 U.S.C. 102(e) as being anticipated by Brunfeld et al. ('432).

Claim 1

Brunfeld et al. ('432) an illumination source (Fig. 3, Ref. 70) that generates electromagnetic radiation that illuminates a first side and a second side of a substrate (Fig. 3, Ref. 75) inserted into an optical inspection system (See Fig. 3); and a detector (Fig. 3, Ref. 90) that detects a light scattering feature on the first side of the substrate from the illumination scattered from the light scattering feature on the first side of the substrate and that detects a light scattering feature on the second side of the substrate from the illumination scattered from the light scattering feature on the second side of the substrate wherein light scattering features on both sides of the substrate are simultaneously detected (Col. 7-8, lines 44-34).

Claim 2, 104

Brunfeld et al. ('432) further discloses the light scattering features further comprise one of a defect in the substrate, a scratch on a surface of the substrate, a pit on a surface of the substrate, a particle on a surface of the substrate, device patterns and pattern anomalies on a surface of the substrate, etched regions on a surface of the substrate, polish roughness on a surface of the substrate, texture on a surface of the substrate, embedded particles in films on a surface of the substrate and any aspect of a surface of the substrate that scatters light (Col. 7, lines 1-16).

Claim 3

Brunfeld et al. ('432) further discloses the illumination source, substrate handler and the detector are incorporated into a stand-alone optical inspection system (See Fig. 3; It is the position of the examiner that the apparatus is placed in a single unit but for illustrative purposes it is not shown so that details of the optics are shown.).

Claim 9, 107

Brunfeld et al. ('432) discloses the illumination source further comprises an image relay assembly (Fig. 3, Ref. 144, 146) that limits the electromagnetic radiation to the edges of the substrate.

Claim 10

Brunfeld et al. ('432) further discloses the image relay assembly further comprises an aperture (Fig. 3, Ref. 76) that limits the electromagnetic radiation generated by the illumination source to the edges of the substrate (See Fig. 3).

Claim 18, ,116

Brunfeld et al. ('432) discloses a substrate handler that holds a substrate inserted into the optical inspection system so that light scattering features on the first and second sides of the substrate are detected simultaneously (See Fig. 3).

Claim 19, 117

Brunfeld et al. ('432) discloses the substrate further comprises a semiconductor wafer (Fig. 3, Ref. 75).

Claim 26, 124

Brunfeld et al. ('432) further discloses the illumination source further comprises a set of light path optics (Fig. 3, Ref. 144, 146) that directs the illumination energy from the illumination source to the substrate (Fig. 3, Ref. 75).

Claim 80, 92, 178, 190

Brunfeld et al. ('432) further discloses a computer system that controls the operation of the illumination source and the detector, wherein the computer system further comprises a

differential measurement process wherein an initial light scattering feature measurement is subtracted from a subsequent light scattering feature measurement; a computer system that controls the illumination source and the detector, the computer system further comprising a module for determining a process problem signature based on the light scattering features detected on the substrate (Fig. 4, Ref. 90).

Claim 83, 181

Brunfeld et al. ('432) further discloses the illumination source further comprises an edge illumination source that directs electromagnetic radiation towards an edge and bevel of the substrate so that the detector receives the illumination scattered from a light scattering feature on the bevel and edge of the substrate and detects light scattering features on the bevel and edge of the substrate (See Fig. 4).

Claim 103

Brunfeld et al. ('432) discloses generating illumination (Fig. 3, Ref. 70) that illuminates a first side and a second side of a substrate (Fig. 3, Ref. 75) inserted into the optical inspection system (See Fig. 3); and receiving, at a detector (Fig. 3, Ref. 90), illumination scattered from a light scattering feature on the first side of the substrate (Fig. 3, Ref. 75) and illumination scattered from a light scattering feature on the second side of the substrate (See Fig. 3, 4); and detecting the light scattering features on the first side of the substrate (Fig. 3, Ref. 75) corresponding to the illumination scattered from the light scattering feature on the first side of the substrate (Fig. 3, Ref. 75) and detecting light scattering features on the second side of the substrate (Fig. 3, Ref. 75) corresponding to the illumination scattered from the light scattering

feature on the second side of the substrate (Fig. 3, Ref. 75) wherein light scattering features on both sides of the substrate (Fig. 3, Ref. 75) are simultaneously detected (Col. 7-8, lines 44-34).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4-8, 20-22, 27-79, 81-82, 84-91, 93, 97-102, 105, 106, 118-120, 125-177, 179-180, 182-189, 191, 195-200 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brunfeld et al. ('432).

Claim 4-8, 105, 106

Brunfeld et al. ('432) discloses the claimed invention except for: substrate handler and the detector are incorporated into a benchtop optical inspection system; optical inspection system is incorporated into a process tool system; optical inspection system is incorporated into an equipment front end module system; a polarizer to generate uniformly polarized electromagnetic radiation that is directed towards the substrate; a shadow casting assembly that limits the electromagnetic radiation to the edges of the substrate; an image relay assembly that limits the electromagnetic radiation to the edges of the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with the modifying optical elements above since it was well known in the art that using these optical

element increases the sensitivity of the measurement data, therefore increasing the reliability of the data.

Claim 20-22, 118-120

Brunfeld et al. ('432) discloses the claimed invention except for: the wafer is unpatterned; the wafer is patterned; a disk drive substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with the different types of mediums since it was well known in the art that inspecting different types of medium surfaces increases the marketability of the apparatus.

Claim 27, 125

Brunfeld et al. ('432) discloses the claimed invention except for the radiation source generates at least deep ultraviolet energy. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with ultraviolet energy since it was well known in the art that using an ultraviolet energy increases the sensitivity in the measured substrate, therefore improving the quality of the manufactured product.

Claims 28-35, 126-133

Brunfeld et al. ('432) discloses the claimed invention except for: a high dynamic range, high precision detector array that is capable of detecting small light scattering features close to large scattering features, differential measurements where small scattering features have been added to high scatter regions and process signatures; a high dynamic range, high precision detector array that is capable of detecting brightfield substrate features; a high dynamic range, high precision detector array that is capable of detecting bar code and alphanumeric substrate

identification substrate features; an anti-blooming detector; the detector provides random access read-out of each pixel associated with the detector and the read-out of each pixel of the detector is non-destructive; the detector further comprises a detector head that comprises a detector chip and a microprocessor that controls the operation of the detector chip; a back thinned detector chip so that electromagnetic radiation is detected through a backside of the detector chip; one or more detector chips each having an array of detector pixels wherein each detector chip is butted against another detector chip to form an larger array of detector pixels. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with different detection above since it was well known in the art that the using different types of detection have different results of sensitivity to the object being measured, therefore using a different types of detection means increases the sensitivity of the measured data.

Claim 36-39, 134-137

Brunfeld et al. ('432) discloses the claimed invention except for: an angle of incidence of scattering feature illumination light on the detector is between 50 degrees and 0.75 degrees; the scattering feature light impinging on the detector is collimated to less than or equal to +/-2 degrees from the nominal angle of incidence; the scattering feature light impinging on the substrate is spatially uniform in intensity across the substrate with uniformity equal to or greater than 50%; the scattering feature light impinging on the substrate is spectrally uniform across the beam collimated equal to or greater than 95%. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with angles of incidence of the above since it was well known in the art that using different angles

illuminates different sizes of defects, therefore increasing the inspection quality of the apparatus.

Claim 40-43, 138-141

Brunfeld et al. ('432) discloses the claimed invention except for: the collection optics that images the scattered illumination from the light scattering features of the substrate onto the detector; the detector further comprises collection optics having a device that scans through a plurality of wavelengths during the inspection of the substrate; the illumination source further comprises a device that scans through a plurality of wavelengths during the inspection of the substrate; a wavelength selectable filter that adjust the wavelength of the electromagnetic radiation during the inspection of a substrate to classify the light scattering feature on the surface of the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with detector and wavelength adjusting optics above since it was well known in the art that detection of different wavelengths increases the ability to measure different types of defects, therefore increasing sensitivity.

Claims 44-51, 91, 142-149, 189

Brunfeld et al. ('432) discloses the claimed invention except for: the illumination source delivers at least 0.25 watts per square inch to the substrate; the illumination source delivers more than 0.25 watts per square inch to the substrate; the illumination source further comprises an arc lamp source that produces deep ultraviolet electromagnetic radiation; the illumination source further comprises one of a laser source, a light emitting diode source, a combination of sources such as deuterium and tungsten, and arc lamps with mercury or other gas mixtures all that produce deep ultraviolet electromagnetic radiation; the illumination source further comprises a focused arc source which reduces the optics needed to focus the electromagnetic radiation onto

the substrate; the illumination source further comprises a broadband electromagnetic radiation source that generates electromagnetic radiation at a plurality of wavelengths; the plurality of wavelengths further comprises 200 nm to 1100 nm; the illumination source is modulated which improves the signal to noise ratio of the system; the illumination source generates infrared electromagnetic radiation that is directed towards the substrate to measure characteristics of the substrate including one of film thickness, substrate structure, thickness and uniformity. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with different illumination devices listed above since it was well known in the art that illuminating with different sources increases the ability to measure different types of defects, therefore increasing the sensitivity of the measured data.

Claims 52-63, 150-161

Brunfeld et al. ('432) discloses the claimed invention except for: a collection light path from the substrate to the detector, the light path further comprising refractive elements wherein the scattered illumination from the light scattering features on the substrate is imaged onto the detector; a collection light path from the substrate to the detector, the light path further comprising a refractive lens and a reflective Schwarzchild lens; a plurality of pixels and a microlens associated with each pixel of the detector wherein the each microlens focuses the scattering feature illumination onto the pixel associated with the microlens; a sensor device having a plurality of pixels, each pixel of the digital sensor having an integrated pixel pre-amplifier; a charge injection device; a CMOS sensor; a CCD sensor; a photodiode array sensor; a plurality of sensor elements wherein the sensor elements are adjacent each other to form the detector; a computer that processes digital data corresponding to the scattered illumination from

the light scattering feature on the substrate; a dithering process; a random integration process. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with the different optical elements listed above since it was well known in the art that using these optical element increases the sensitivity of the measurement data, therefore increasing the reliability of the data.

Claim 64-79, 93, 162-177, 191

Brunfeld et al. ('432) discloses the claimed invention except for: a substrate holder further comprising one or more edge gripper mechanisms that support the substrate at its edges so that both sides of the substrate are optically inspected; the substrate handler further comprises one or more wheels that rotate the substrate holder to position the substrate; the substrate handler further comprises one or more ring bearings that permit rotation of the substrate holder to position the substrate; the edge gripper mechanism further comprise an edge gripper structure and a support structure wherein the edge gripper structure grips the substrate and the support structure supports the substrate when the edge gripper structure is retracted; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the edge gripper mechanism further comprises a support structure and an edge gripper structure integrated into the support structure to grip the substrate wherein the edge gripper structure extends out from the support structure when the substrate is being gripped; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a

tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the substrate handler further comprises an edge gripper mechanism and a lifting mechanism wherein the lifting mechanism moves the substrate into a position and retracts away from the substrate; the edge gripper mechanism further comprise an edge gripper structure and a support structure wherein the edge gripper structure grips the substrate and the support structure supports the substrate when the edge gripper structure is retracted; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the edge gripper mechanism further comprises a support structure and an edge gripper structure integrated into the support structure to support the substrate and grip the substrate wherein the edge gripper structure extends out from the support structure when the substrate is being gripped; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the substrate handler orients a notch of the substrate at approximately 45 degrees with respect to the electromagnetic radiation from the illumination source. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with the different support structures listed above since it was well known in the art that each provide a support that allows uniform control of the substrate, therefore increasing the

speed at which each substrate can be inspected.

Claim 81-82, 179-180

Brunfeld et al. ('432) discloses the claimed invention except for: a sealed enclosure to reduce contaminants within the optical inspection system; the sealed enclosure is one or more of vacuum tight, gas tight and light tight. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with a sealed enclosure since it was well known in the art that using a sealed enclosure prevents contamination of the optical elements, therefore reducing the amount of time needed to maintain the optical instrument.

Claim 84-90, 97, 98, 182-188, 195-196

Brunfeld et al. ('432) discloses the claimed invention except for: a wavelength band pass filter that selectively permits scattering feature illumination for a particular wavelength to impinge of the detector; a shutter that blocks the electromagnetic radiation before the electromagnetic radiation illuminates the substrate; an intensity sensor that measures the intensity of the electromagnetic radiation emitted by the illumination source; a polarizer that filters the scattering feature light according to the polarization of the scattering feature scattered light; a polarizer that is aligned so that the illumination is cross polarized with respect to the polarizer at the detector; the illumination source further comprises a homogenizer; a device that filters infrared electromagnetic radiation out of the illumination directed towards the substrate; a beam dump that absorbs the illumination that is not scattered by the light scattering features on the first and second sides of the substrate, the beam dump further comprising one or more light absorbing plates wherein the light is reflected between the one or more light absorbing plates;

one or more light absorbing plates further comprises a first light absorbing plate positioned so that the light strikes the first light absorbing plate at an angle of 30 to 60 degrees. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with optical filter elements disclosed above since it was well known in the art that using filtering optical type elements helps to decrease background noise, therefore producing a signal that is clearer.

Claim 99-102, 197-200

Brunfeld et al. ('432) discloses the claimed invention except for: the disk drive substrate further comprises a disk region that surrounds a central hole and wherein the illumination source generates a washer shaped, illumination pattern that illuminates the disk region but not the central hole; the illumination source further comprises a first illumination source that generates an illumination pattern that illuminates a first portion of the disk region wherein the disk region is entirely illuminated when the disk drive substrate is rotated; the illumination source further comprises a second illumination source that generates an illumination pattern that illuminates a second portion of the disk region different from the first portion, wherein the first and second illumination sources are rotated 90 degrees with respect to each other and the first and second portions of the disk region comprise the entire disk region and the illumination is parallel to the texture thereby enhancing particle and pit defects while suppressing texture scatter; the illumination source generates electromagnetic radiation that is perpendicular to a texture of the disk drive substrate to measure the texture of the disk drive substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Brunfeld et al. ('432) with different illumination devices listed above since it was well known in

the art that illuminating with different sources increases the ability to measure different types of defects, therefore increasing the sensitivity of the measured data.

4. Claims 11, 12, 109, 110 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brunfeld et al. ('432) in view of Wack et al. ('951).

Claim 11, 109

Brunfeld et al. ('432) substantially teaches the claimed invention except that it does not show a first illumination source unit and a second illumination source unit, wherein the first illumination source unit provides electromagnetic radiation to the first side of the substrate and the second illumination source unit provides electromagnetic radiation to the second side of the substrate. Wack et al. ('951) shows that it is known to provide a first illumination source unit (Fig. 12, Ref. 44) and a second illumination source unit (Fig. 12, Ref. 44), wherein the first illumination source unit provides electromagnetic radiation to the first side of the substrate and the second illumination source unit provides electromagnetic radiation to the second side of the substrate (See Fig. 12) for an apparatus for inspection of a surface. It would have been obvious to combine the device of Brunfeld et al. ('432) with the two illumination sources of Wack et al. ('951) for the purpose of providing wavelength separation of the two optical beams therefore not allowing the two illumination beams to interfere with each other therefore increasing the sensitivity of the measurement.

Claim 12, 110

Brunfeld et al. ('432) substantially teaches the claimed invention except that it does not show a first detector unit and a second detector unit wherein the first detector unit detects light

scattering features on the first side of the substrate and the second detector unit detects light scattering features on the second side of the substrate. Wack et al. ('951) shows that it is known to provide a first detector unit (Fig. 3, Ref. 46c) and a second detector unit (Fig. 3, Ref. 46b) wherein the first detector unit detects light scattering features on the first side of the substrate and the second detector unit detects light scattering features on the second side of the substrate for an optical inspection apparatus for a surface. It would have been obvious to combine the device of Brunfeld et al. ('432) with the detectors of Wack et al. ('951) for the purpose of providing wavelength separation detection of the two optical beams therefore not allowing the detection to interfere with each other therefore increasing the sensitivity of the measurement.

5. Claims 228-230, 241-243, 248-250, 264, 304 are rejected under 35 U.S.C. 102(e) as being anticipated by Wack et al. ('951).

Claim 228

Wack et al. ('951) discloses an illumination source (Fig. 12, Ref. 44) that generates electromagnetic radiation that illuminates a first side of a substrate (Fig. 12, Ref. 40) inserted into an optical inspection system; and a detector (Fig. 12, Ref. 46b) that detects a light scattering feature on the first side of the substrate (Fig. 12, Ref. 40) from the illumination scattered from the light scattering feature on the first side of the substrate (Fig. 12, Ref. 40) wherein the light scattering feature from below 0.1 microns to 100 microns is detected (Col. 53, lines 36-40).

Claim 229

Wack et al. ('951) further discloses the light scattering features further comprise one of a defect in the substrate, a scratch on a surface of the substrate, a pit on a surface of the substrate, a

particle on a surface of the substrate, device patterns and pattern anomalies on a surface of the substrate, etched regions on a surface of the substrate, polish roughness on a surface of the substrate, texture on a surface of the substrate, embedded particles in films on a surface of the substrate and any aspect of a surface of the substrate that scatters light (Col. 53, lines 1-11).

Claim 230

Wack et al. ('951) further discloses the illumination source (Fig. 12, Ref. 44), substrate handler (Fig. 12, Ref. 42) and the detector (Fig. 12, Ref. 46b) are incorporated into a stand-alone optical inspection system (See Fig. 12; It is the position of the examiner that the apparatus is placed in a single unit but for illustrative purposes it is not shown so that details of the optics are shown.).

Claim 241

Wack et al. ('951) discloses the illumination source generates bright field illumination and dark field illumination (Col. 49-50, lines 62-51).

Claim 242

Wack et al. ('951) further discloses a substrate handler (Fig. 12, Ref. 42) that holds a substrate (Fig. 12, Ref. 40) inserted into the optical inspection system.

Claim 243

Wack et al. ('951) discloses the substrate further comprises a semiconductor wafer (Col. 5, lines 44-65).

Claim 248

Wack et al. ('951) the illumination source further comprises a plurality of illumination source units (Fig. 12, Ref. 44) that each illuminate a different parallel strip of the substrate to

provide illumination uniformity.

Claim 249

Wack et al. ('951) discloses the illumination source further comprises a plurality of illumination source units located around the periphery of the substrate (See Fig. 12).

Claim 250

Wack et al. ('951) further discloses the illumination source (Fig. 12, Ref. 44) further comprises a set of light path optics (Fig. 12, Ref. 48) that directs the illumination energy from the illumination source to the substrate.

Claim 264

Wack et al. ('951) further discloses the detector (Fig. 10, Ref. 92) further comprises collection optics (Fig. 10, Ref. 86) that images the scattered illumination from the light scattering features of the substrate onto the detector.

Claim 304

Wack et al. ('951) discloses a computer system (Fig. 12, Ref. 54) that controls the operation of the illumination source and the detector, wherein the computer system further comprises a differential measurement process wherein an initial light scattering feature measurement is subtracted from a subsequent light scattering feature measurement (See Fig. 12).

5. Claims 231-237, 244-246, 251-263, 265-268, 275-303, 305-326 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. ('951).

Claim 231-237

Wack et al. ('951) discloses the claimed invention except for: substrate handler and the detector are incorporated into a benchtop optical inspection system; optical inspection system is incorporated into a process tool system; optical inspection system is incorporated into an equipment front end module system; a polarizer to generate uniformly polarized electromagnetic radiation that is directed towards the substrate; a shadow casting assembly that limits the electromagnetic radiation to the edges of the substrate; an image relay assembly that limits the electromagnetic radiation to the edges of the substrate; an aperture that limits the electromagnetic radiation generated by the illumination source to the edges of the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with the modifying optical elements above since it was well known in the art that using these optical element increases the sensitivity of the measurement data, therefore increasing the reliability of the data.

Claim 244-246

Wack et al. ('951) discloses the claimed invention except for: the wafer is unpatterned; the wafer is patterned; a disk drive substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with the different types of mediums since it was well known in the art that inspecting different types of medium surfaces increases the marketability of the apparatus.

Claim 251

Wack et al. ('951) discloses the claimed invention except for the radiation source generates at least deep ultraviolet energy. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with ultraviolet

energy since it was well known in the art that using an ultraviolet energy increases the sensitivity in the measured substrate, therefore improving the quality of the manufactured product.

Claim 252-259

Wack et al. ('951) discloses the claimed invention except for: a high dynamic range, high precision detector array that is capable of detecting small light scattering features close to large scattering features, differential measurements where small scattering features have been added to high scatter regions and process signatures; a high dynamic range, high precision detector array that is capable of detecting brightfield substrate features; a high dynamic range, high precision detector array that is capable of detecting bar code and alphanumeric substrate identification substrate features; an anti-blooming detector; the detector provides random access read-out of each pixel associated with the detector and the read-out of each pixel of the detector is non-destructive; the detector further comprises a detector head that comprises a detector chip and a microprocessor that controls the operation of the detector chip; a back thinned detector chip so that electromagnetic radiation is detected through a backside of the detector chip; one or more detector chips each having an array of detector pixels wherein each detector chip is butted against another detector chip to form an larger array of detector pixels. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with different detection above since it was well known in the art that the using different types of detection have different results of sensitivity to the object being measured, therefore using a different types of detection means increases the sensitivity of the measured data.

Claim 260-263

Wack et al. ('951) discloses the claimed invention except for: an angle of incidence of scattering feature illumination light on the detector is between 50 degrees and 0.75 degrees; the scattering feature light impinging on the detector is collimated to less than or equal to +/-2 degrees from the nominal angle of incidence; the scattering feature light impinging on the substrate is spatially uniform in intensity across the substrate with uniformity equal to or greater than 50%; the scattering feature light impinging on the substrate is spectrally uniform across the beam collimated equal to or greater than 95%. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with angles of incidence of the above since it was well known in the art that using different angles illuminates different sizes of defects, therefore increasing the inspection quality of the apparatus.

Claim 265-267

Wack et al. ('951) discloses the claimed invention except for: the detector further comprises collection optics having a device that scans through a plurality of wavelengths during the inspection of the substrate; the illumination source further comprises a device that scans through a plurality of wavelengths during the inspection of the substrate; a wavelength selectable filter that adjust the wavelength of the electromagnetic radiation during the inspection of a substrate to classify the light scattering feature on the surface of the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with detector and wavelength adjusting optics above since it was well known in the art that detection of different wavelengths increases the ability to measure different types of defects, therefore increasing sensitivity.

Claim 268-275

Wack et al. ('951) discloses the claimed invention except for: the illumination source delivers at least 0.25 watts per square inch to the substrate; the illumination source delivers more than 0.25 watts per square inch to the substrate; the illumination source further comprises an arc lamp source that produces deep ultraviolet electromagnetic radiation; the illumination source further comprises one of a laser source, a light emitting diode source, a combination of sources such as deuterium and tungsten, and arc lamps with mercury or other gas mixtures all that produce deep ultraviolet electromagnetic radiation; the illumination source further comprises a focused arc source which reduces the optics needed to focus the electromagnetic radiation onto the substrate; the illumination source further comprises a broadband electromagnetic radiation source that generates electromagnetic radiation at a plurality of wavelengths; the plurality of wavelengths further comprises 200 nm to 1100 nm; the illumination source is modulated which improves the signal to noise ratio of the system; the illumination source generates infrared electromagnetic radiation that is directed towards the substrate to measure characteristics of the substrate including one of film thickness, substrate structure, thickness and uniformity. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with different illumination devices listed above since it was well known in the art that illuminating with different sources increases the ability to measure different types of defects, therefore increasing the sensitivity of the measured data.

Claim 276-287

Wack et al. ('951) discloses the claimed invention except for: a collection light path from the substrate to the detector, the light path further comprising refractive elements wherein the scattered illumination from the light scattering features on the substrate is imaged onto the

detector; a collection light path from the substrate to the detector, the light path further comprising a refractive lens and a reflective Schwarzchild lens; a plurality of pixels and a microlens associated with each pixel of the detector wherein the each microlens focuses the scattering feature illumination onto the pixel associated with the microlens; a sensor device having a plurality of pixels, each pixel of the digital sensor having an integrated pixel pre-amplifier; a charge injection device; a CMOS sensor; a CCD sensor; a photodiode array sensor; a plurality of sensor elements wherein the sensor elements are adjacent each other to form the detector; a computer that processes digital data corresponding to the scattered illumination from the light scattering feature on the substrate; a dithering process; a random integration process. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with the different optical elements listed above since it was well known in the art that using these optical element increases the sensitivity of the measurement data, therefore increasing the reliability of the data.

Claim 288-303

Wack et al. ('951) discloses the claimed invention except for: a substrate holder further comprising one or more edge gripper mechanisms that support the substrate at its edges so that both sides of the substrate are optically inspected; the substrate handler further comprises one or more wheels that rotate the substrate holder to position the substrate; the substrate handler further comprises one or more ring bearings that permit rotation of the substrate holder to position the substrate; the edge gripper mechanism further comprise an edge gripper structure and a support structure wherein the edge gripper structure grips the substrate and the support structure supports the substrate when the edge gripper structure is retracted; the support structure has a beveled

portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the edge gripper mechanism further comprises a support structure and an edge gripper structure integrated into the support structure to grip the substrate wherein the edge gripper structure extends out from the support structure when the substrate is being gripped; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the substrate handler further comprises an edge gripper mechanism and a lifting mechanism wherein the lifting mechanism moves the substrate into a position and retracts away from the substrate; the edge gripper mechanism further comprise an edge gripper structure and a support structure wherein the edge gripper structure grips the substrate and the support structure supports the substrate when the edge gripper structure is retracted; the support structure has a beveled portion and a flat pad end portion wherein the substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the edge gripper mechanism further comprises a support structure and an edge gripper structure integrated into the support structure to support the substrate and grip the substrate wherein the edge gripper structure extends out from the support structure when the substrate is being gripped; the support structure has a beveled portion and a flat pad end portion wherein the

substrate rests on the beveled portion; the edge gripper structure further comprises a tapered region and a beveled indentation end of the tapered region, the beveled indentation end gripping an edge of the substrate without extending beyond the edge of the substrate; the substrate handler orients a notch of the substrate at approximately 45 degrees with respect to the electromagnetic radiation from the illumination source. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with the different support structures listed above since it was well known in the art that each provide a support that allows uniform control of the substrate, therefore increasing the speed at which each substrate can be inspected.

Claim 305-306

Wack et al. ('951) discloses the claimed invention except for: a sealed enclosure to reduce contaminants within the optical inspection system; the sealed enclosure is one or more of vacuum tight, gas tight and light tight. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with a sealed enclosure since it was well known in the art that using a sealed enclosure prevents contamination of the optical elements, therefore reducing the amount of time needed to maintain the optical instrument.

Claim 307

Wack et al. ('951) discloses the claimed invention except for the illumination source further comprises an edge illumination source that directs electromagnetic radiation towards a bevel of the substrate so that the detector receives the illumination scattered from a light scattering feature on the bevel of the substrate and detects light scattering features on the bevel of

the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with edge illumination since it was well known in the art that using edge illumination provides for a complete scanning of the surface, therefore providing for a defect free product.

Claim 308-322

Wack et al. ('951) discloses the claimed invention except for: a wavelength band pass filter that selectively permits scattering feature illumination for a particular wavelength to impinge of the detector; a shutter that blocks the electromagnetic radiation before the electromagnetic radiation illuminates the substrate; an intensity sensor that measures the intensity of the electromagnetic radiation emitted by the illumination source; a polarizer that filters the scattering feature light according to the polarization of the scattering feature scattered light; a polarizer that is aligned so that the illumination is cross polarized with respect to the polarizer at the detector; the illumination source further comprises a homogenizer; a device that filters infrared electromagnetic radiation out of the illumination directed towards the substrate; a beam dump that absorbs the illumination that is not scattered by the light scattering features on the first and second sides of the substrate, the beam dump further comprising one or more light absorbing plates wherein the light is reflected between the one or more light absorbing plates; one or more light absorbing plates further comprises a first light absorbing plate positioned so that the light strikes the first light absorbing plate at an angle of 30 to 60 degrees. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with optical filter elements disclosed above since it was well known

in the art that using filtering optical type elements helps to decrease background noise, therefore producing a signal that is clearer.

Claim 323-326

Wack et al. ('951) discloses the claimed invention except for: the disk drive substrate further comprises a disk region that surrounds a central hole and wherein the illumination source generates a washer shaped, illumination pattern that illuminates the disk region but not the central hole; the illumination source further comprises a first illumination source that generates an illumination pattern that illuminates a first portion of the disk region wherein the disk region is entirely illuminated when the disk drive substrate is rotated; the illumination source further comprises a second illumination source that generates an illumination pattern that illuminates a second portion of the disk region different from the first portion, wherein the first and second illumination sources are rotated 90 degrees with respect to each other and the first and second portions of the disk region comprise the entire disk region and the illumination is parallel to the texture thereby enhancing particle and pit defects while suppressing texture scatter; the illumination source generates electromagnetic radiation that is perpendicular to a texture of the disk drive substrate to measure the texture of the disk drive substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Wack et al. ('951) with different illumination devices listed above since it was well known in the art that illuminating with different sources increases the ability to measure different types of defects, therefore increasing the sensitivity of the measured data.

6. Claim 238-240 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wack et al. ('951).

Claim 238-240

Wack et al. ('951) substantially teaches the claimed invention except that it does not show a movable detector unit that is movable between two or more positions so that the angle of the movable detector unit with respect to the substrate and the angle that the scattered illumination enters the movable detector unit is adjustable or movable illumination source. Bischoff et al. ('015) shows that it is known to provide a movable detector unit that is movable between two or more positions so that the angle of the movable detector unit with respect to the substrate and the angle that the scattered illumination enters the movable detector unit is adjustable or a movable illumination source (Col. 3, lines 21-26) for an optical surface inspection apparatus. It would have been obvious to combine the device of Wack et al. ('951) with the adjustable detector of Bischoff et al. ('015) for the purpose of providing detection over the entire scattering angles for detection of defects, therefore allowing the device the detect small and larger detects.

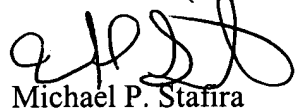
Allowable Subject Matter

7. Claims 13-17, 23-25, 94-96, 111-115, 121-123, 192-194, 247 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael P. Stafira whose telephone number is 571-272-2430. The examiner can normally be reached on 4/10 Schedule Mon.-Thurs..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Toatley can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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